

# THE ZOOLOGIST

---

No. 689.—November, 1898.

---

## BIOLOGICAL SUGGESTIONS.

### ASSIMILATIVE COLOURATION.

By W. L. DISTANT.

(Continued from p. 409.)

#### PART II.

FISH appear to vary in colour and in an assimilative manner to the hue of the water in which they are confined.\* According to Frank Buckland, "this is the case particularly with Minnows, Sticklebats, and Trout. Mr. Grove, the fishmonger at Charing Cross, will tell you where a Trout comes from by its colour. The Trout which live in peat-coloured water are sometimes nearly black; those from fine running streams, such as the clear chalk

\* The action of the environment on fishes does not appear to be confined to colour alone. According to Prof. Seeley, "there are local races of many fishes which, under the changed conditions of physical geography, which from time to time affect the distribution of life on the earth, have become isolated from the rest of the race, so as to live on table-lands or low plains, in cold mountain lakes or in shallow swamps, in sluggish waters or rapid torrents, and thus, differently circumstanced, have developed into varieties distinguished by size, form, colour, and certain internal and external differences in the organs and proportions of the body" ('The Fresh-water Fishes of Europe,' p. 3). *Leuciscus muticellus* has all the fins "transparent and unspotted in Austrian specimens, but in examples from the Neckar the fins of the lower part of the body are yellow at the base, and this colour is occasionally seen in the dorsal and caudal. Bavarian fish have much black pigment in spots on the dorsal and caudal fins" (*ibid.* p. 173).

streams about Winchester, are of a beautiful silvery colour. Gudgeons placed in a glass bowl will become very white, and lose the beautiful brown colour on their backs." "A fishmonger at Billingsgate Market told me he generally knew from what part of the coast fish came by the colour of them. This observation was *à propos* to a quantity of Dutch Jack that were displayed on his slab; and which looked very dingy and dark-coloured, as though they had lived in stagnant and dirty water; very different from a clean and bright-coloured Thames Jack." "Sticklebacks are wonderful fish to change their colour. I have seen Sticklebacks at the tail of a mill pond at Islip of the most beautiful iridescent colour; the bottom was composed of clean white gravel stones. Again, there is a ditch running round Christchurch meadow at Oxford; here the water is black and dirty, and the Sticklebacks are of a brown and almost black colour."\* The same author considers that "the Black-backed Salmon" of the Galway river "are fish which have spent most of their lives in dark bog-coloured water, and hence they have assumed the peculiar dark appearance they present, for, as we all know, the colour of the fish is wonderfully influenced by the colour of the water in which it lives."† There is a well-known rock on the coast of Cornwall, about five leagues from the land, and standing up from the plain ground which spreads to a large distance round it. The top of the rock is full of gullies shaded with weeds, and Congers which are caught on it are always black, while close to its base these fish are always white.‡ From Great Yarmouth it is reported that Flounders (*Pleuronectes flesus*) when sea-caught are lighter hued than those taken on a muddy bottom.§ "The Sunfish (*Labrus auritus*, Linn.) caught in the deep waters of Green River in Kentucky exhibit a depth of olive brown quite different from the general tint of those caught in the colourless waters of the

\* 'Curiosities Nat. Hist.,' pop. edit., 1st ser., pp. 235-7, 239.

† *Ibid.* 4th ser., p. 271. This last conclusion seems scarcely borne out in a previous remark by the same naturalist that "white Trout prefer streams which contain bog water." . . . "On the east side of Lough Corrib no white Trout are found—there is but very little bog water; but they are found on the west side, where the feeders of the lake run through a country abounding with bogs" (*ibid.* 4th ser., p. 253).

‡ Jon. Couch, 'Hist. Fishes Brit. Islands,' vol. iv. p. 342.

§ A. Patterson, 'Zoologist,' 4th ser. vol. i. p. 557.



Ohio or Schuylkill; those of the reddish-coloured waters of the bayous of the Louisiana swamps look as if covered with a coppery tarnish; and, lastly, those met with in streams that glide beneath cedars or other firs have a pale and sallow complexion.”\* A no less authority than Dr. Günther states: “Trout with intense ocellated spots are generally found in clear rapid rivers, and in small open alpine pools; in the large lakes with pebbly bottom the fish are bright silvery, and the ocellated spots are mixed with or replaced by X-shaped black spots; in pools or parts of lakes with muddy or peaty bottom the Trout are of a darker colour generally, and when enclosed in caves or holes they may assume an almost uniform blackish colouration.”† “Minnows have the power common to most fishes of rapidly assimilating to the varying colour of the stream. They change from brown to gold, from gold to brown.”‡ The Paradise-fish (*Polyacanthus* sp.), a pet kept in confinement throughout China, has a colour in dark or muddy waters of a “dull uniform brown; and it is only when living in clear water, exposed to the sunlight, that the golden hue and red transverse bands make their appearance.” “Cod from the British seas and German Ocean are usually greenish or brownish olive in colour, with a number of yellowish or brown spots; but more to the north darker, and often uniformly coloured specimens are more common; while in the race from Greenland, Scandinavia, and northern Norway, there is frequently a large irregular black patch on each side of the body.”§ In the South Atlantic Mr. Cunningham secured by the aid of the towing-net a bright blue Isopodous crustacean (*Idotea annulata*), and states that, according to Spence Bate, “the blue colour appears to be a peculiarity of pelagic species.”||

Entomologists have long noticed the effects of assimilative colouration, even in our own country. Mr. Dale, of Glanvilles Wootton, has truly remarked: “Where do we find whitish or brilliant-coloured species of Lepidoptera, such as *Melanargia galatea*, *Lycæna corydon*, *L. adonis*, *Eubolia bipunctaria*, *Mela-*

\* ‘Audubon and his Journals,’ vol. ii. p. 519.

† ‘Introd. Study Fishes,’ p. 632.

‡ Watson, ‘Sketches of Brit. Sport. Fishes,’ p. 77.

§ Lydekker, ‘Roy. Nat. Hist.,’ vol. v. pp. 412, 433.

|| ‘Notes Nat. Hist. Strait of Magellan,’ p. 42.

*nippe procellata*, and the light variety of *Gnophos obscuraria*, &c.? Why, on the white and light-coloured soils of the south of England, *i.e.* chalk and limestone. On the other hand, we find the dark variety of *G. obscuraria*, and various dark-coloured species, on black peaty soils."\* A noctuid moth, *Agrotis lucerneae*, not uncommon in Britain, when found on the chalk downs in the Isle of Wight has been thus described: "It rests in chinks on the ground, and is of a soft silky grey colour, and covered with such thick and long scales as to give it a furry appearance. Although abundant enough by night, it requires a long search to find a single specimen by day, so difficult is it to distinguish in its native haunts, the long pale silky hairs resembling exactly the rough surface of the chalk dusted with the darker atoms of the soil above." This moth has also been caught by the same entomologist on the east coast of Scotland, and then thus differently described: "On black rocks, sometimes reeking with moisture, and which were as black as the rocks on which they rested." Mr. Tutt, to whom we are indebted for these notes and observations, ascribes the colouration in each case as due to the action of natural selection. We may at least say in respect to other instances he has adduced that this explanation is not so apparent. *Noctua glareosa* "is of a pale dove-coloured grey, sometimes tinged with rosy," and with three dark spots. "The Sligo specimens are very white,—Scotch specimens more slaty; the Shetland specimens are of a rich blackish brown colour." *Epunda lichenea* "is a mottled greenish grey or greenish ochreous species, which is confined to a few coast districts. The Portland specimens are greenish white; the Teignmouth specimens dark greenish ochreous, mottled with red. The moths from these two localities have quite a different appearance, owing to the different kind of rocks on which they rest at these places." *Amphidasys betularia*, a Geometrid moth, "as it rests on a trunk in our southern woods, is not at all conspicuous, and looks like a natural splash or scar, or a piece of lichen"; but near our large towns, where there are factories, and where vast quantities of soot are

\* 'Entomologist,' vol. xxvi. p. 355. Mr. Wallace considers that the original colour of butterflies was a greyish or brownish neutral tint ('Darwinism,' p. 274); and the same opinion is held by Dr. Dixey in his study of the phylogeny of the Pierinæ ('Trans. Ent. Soc. Lond.,' 1894, p. 290).



day by day poured out from countless chimneys, this moth "has during the last fifty years undergone a remarkable change. The white has entirely disappeared, and the wings have become totally black, so black that it has obtained the cognomen 'negro' from naturalists."\* The dipterous insect *Cælopa frigida* undergoes its transformations in the black sea-weed cast up by the spring tides. The flies and also the pupæ are black.† In a revision of the American orthopterous genus *Spharageomon*, Mr. Morse states: "Variation in colour in this genus, in common with other *Edipodinæ*, counts for very little; the same species or race may be of all shades from a general dark fuscous to a pale buff or even a bright reddish brown, even in specimens from the same spot, yet it is probable that the general tint of a large series will be found to agree with the colour of the soil of the locality, or other peculiarity of environment. Specimens of different species from different localities in Colorado show a striking reddish almost rosaceous colouration due to some such cause."‡ Of course this can only apply to the insects when at rest, otherwise their more gaily-coloured under wings would contradict the view advocated. A previous American writer, Mr. Brunner, had proposed that climatic differences had accounted for the varied colouration of the wings of some North American Locusts.§ Eimer has some excellent observations on this point, and with these insects:—"The Grasshopper with red hinder wings banded with black, which is so common with us (in Germany) in summer, *Acridium germanicum* (*Edipodea germanica*), when it occurs on the reddish brown Triassic clay of Tübingen, resembles this ground so closely with its wings folded that it cannot be distinguished from it. A little above the clay on the hills of this neighbourhood there occurs a whitish sandstone, sometimes only for the breadth of a path or in somewhat larger surfaces, frequently surrounded by the former. On these small patches of lighter ground I find regularly only Grasshoppers with quite light upper wings, so that they can scarcely be distinguished from the soil. And I have elsewhere observed the same remarkable

\* Tutt, 'British Moths,' pp. 144, 149, 179, 305.

† Miall, 'Nat. Hist. Aquat. Ins.,' p. 373.

‡ 'Psyche,' vol. vii. p. 288.

§ 'Science,' 1893, p. 133.

adaptation. One of my friends who is not usually accustomed to pay special attention to such animals, told me that he had been much surprised to notice that on the two banks of a brook on which the soil was of different colours, the Grasshoppers were in each case exceedingly like the ground in colour. Without doubt these were *Acridium germanicum* or *A. cœrulescens*,—the latter species appears to show the same adaptation.”\* Canon Tristram in his North African travels met with an area of the limestone conglomerate with earlier pebbles, in which a fine white flint, not previously observed, predominated. Here, to use his own words, “we found only two living things through the whole day—a curious white Scorpion, and a Desert Lark (*Annomanes regulus*, Bp.).”† In Kamschatka, where the ground is so long covered with snow, Mr. Guillemard, in comparing the Great and Lesser Spotted Woodpeckers, the Capercailzie, and the Marsh Tit, with the forms found in Europe, remarks: “In all these the differences consist for the most part in the greater predominance of white in the plumage, and this tendency to albidism is noticeable, as I have already mentioned, in other animals besides the birds; the Dogs and Horses likewise showing it in a marked degree.”‡ Sometimes the effect may be very sudden and of an artificial character. It is difficult to explain the process as described by C. J. Andersson in South Africa:—“In the course of the first day’s journey, we traversed an immense hollow, called Etosha, covered with saline incrustations, and having wooded and well-defined borders. Such places are in Africa designated ‘salt-pans.’ The surface consisted of a soft greenish yellow

\* ‘Organic Evolution,’ Eng. transl., p. 146. Sometimes we have records of environmental changes in the colours of insects without corresponding particulars being given. These are still suggestive. Thus Gerard states in the ‘Dictionnaire d’Histoire naturelle’ of D’Orbigny (article “Espèce”), “that when the small brown Honey-bees from High Burgundy are transported into Bresse—although not very distant—they soon become larger, and assume a yellow colour; this happens even in the second generation” (cf. Varigny, *ibid.* p. 53). Again, M. d’Apehier de Pruns (‘Revue Horticole,’ 1883, p. 316) has recorded that “at Brasse les Mines, in Central France, white Oxen become of lighter hue, and Pheasants, Pigeons, Ducks, &c., have more or less white feathers; plants with variegated leaves soon become uniformly green” (cf. Varigny, *ibid.* p. 54).

† ‘The Great Sahara,’ p. 214.

‡ ‘Cruise of the Marchesa,’ 2nd edit., p. 84.

clay soil, strewed with fragments of small sandstone, of a purple tint. Strange to relate, we had scarcely been ten minutes on this ground when the lower extremities of ourselves and cattle became of the same purple colour.”\*

One of the most explicit observations bearing on this phase of animal colouration has been contributed by the late Mr. J. J. Monteiro. In Angola he found that in the districts where indications of copper were found, “the ‘Plantain-eaters’ are also most abundant, more so than in any other part of Angola I have been in”; . . . “the most singular circumstance connected with this bird is the fact that the gorgeous blood-red colour of its wing feathers is soluble, especially in weak solution of ammonia, and that this soluble colouring matter contains a considerable quantity of copper, to which its colour may very probably be due. My attention was first called to this extremely curious and unexpected fact by Prof. Church’s paper in the ‘Phil. Trans.’ for 1869; and on my last voyage home from the coast, I purchased a large bunch of the red wing feathers in the market at Sierra Leone, with which my brother-in-law, Mr. Hy. Bassett, F.C.S., has verified Prof. Church’s results conclusively, and has found even a larger proportion of copper in the colouring matter extracted from these feathers.”† This colour, however, as we might surmise, was sufficiently independent of the copper to have become constant, for Mr. Monteiro kept two birds in confinement in England, during which time they moulted regularly every year, “and reproduced the splendidly coloured feathers, of the same brightness, without the possibility of getting any copper, except what might have entered into the composition of their food, which was most varied, consisting of every ripe fruit in season, cooked vegetables and roots, rice, bread, biscuits, dried fruit, &c.” On the other hand, Dr. Bowdler Sharpe was informed by the late African traveller, Jules Verreaux, “that the bird often gets caught in violent showers during the rainy season, when the whole of this brilliant red colour in the wing feathers gets washed out, and the quills become pinky white, and after two or three days the colour is renewed, and the wing resumes its former

\* ‘Lake Ngami,’ p. 187.

† ‘Angola,’ vol. ii. p. 75.

beauty.”\* This cannot be taken as an instance of pure but only partial assimilative colouration, but is sufficient to prove that colour may be largely derived from the mineral constituents of the earth's surface, and in this way can scarcely be altogether ascribed to the action of “natural selection.” These bright wing feathers may have subsequently served the purpose of “recognition markings”?, but seem certainly not derived directly for that purpose.

A better example may be found in the Red Hartebeest (*Alcelaphus cokei*). Sir H. H. Johnston narrates of this species: “Being a deep red-brown in colour, and standing one by one stock-still at the approach of the caravan, it was really most difficult and puzzling sometimes to know which was Hartebeest and which was ant-hill; for the long grass hiding the Antelope's legs left merely a red-humped mass, which, until it moved, might well be the mound of red earth constructed by the white termites. The unconscious mimicry was rendered the more ludicrously exact sometimes by the sharply-pointed flag-like leaves of a kind of squill—a liliaceous plant—which frequently crowned the summit of the ant-hill or grew at its base, thus suggesting the horns of an Antelope, rather with the head erect, or browsing low down. The assimilation cannot have been fancied on my part, for it deceived even the sharp eyes of my men; and again and again a Hartebeest would start into motion at twenty yards distance, and gallop off, while I was patiently stalking an ant-hill, and crawling on my stomach through thorns and aloes, only to find the supposed Antelope an irregular mass of red clay.”† This would seem to be almost an instance of acquired or active mimicry on the part of this animal. Here the whole question to be considered is what was the original home of this Red Hartebeest? Is it a creature of these red-earthed plains, the character of which is so prominently shown in these gigantic ant-hills?

\* ‘Cassell's Nat. Hist.,’ vol. iii. p. 330. Dr. Sharpe has subsequently expressed further doubt on the suggested cause of this colouration: “The Touracous are birds which live in trees, and do not apparently descend to the ground, while the red feathers have been assumed by specimens in captivity, some of which moulted more than once” (‘Roy. Nat. Hist.,’ vol. iv. p. 13).

† ‘The Kilima-Njaro Expedition,’ p. 65.



Dr. Hans Meyer remarks that "every observer must be struck with the general similarity in colour and partly also in form of the larger African mammals to the prevailing colours and features of the regions they frequent. At a distance it is scarcely possible to tell a Hartebeest at rest from one of the reddish ant-heaps which everywhere abound; the long-legged, long-necked Giraffe might easily pass for a dead mimosa, the Rhinoceros for a fallen trunk, the grey-brown Zebra for a clump of grass or thorn scrub. It is only their movements that betray their real character."\* The Lichtenstein Hartebeest (*Bubalis lichtensteini*) is also of a more or less uniform colour, "saffron, with a golden tinge throughout"; while the more common Hartebeest (*Bubalis caama*), which has a wider distribution, is also in general colour of a "reddish brown, with violet tinge throughout"; and Messrs. Nicolls and Eglington, who have been quoted as to the colour of both these animals, describing the habits of the last, write:—"The Hartebeest is never met with in very thick bush, or hilly country, but frequents either the bare open flats or plains sparsely covered with camel-thorn trees (*Acacia giraffæ*), and where there are treeless glades to be met with."†

It may have possibly struck the reader by this time that the surmise of the writer is that, in the first instance, and in the long past, animals were uniformly and assimilatively coloured in connection with their principal surroundings, and that as they migrated through scarcity of food owing to excessive multiplication or other causes, or through the alteration of climatic condition, their changed environment placed them under altogether different conditions, and the modifying influence of natural selection then became a magician's wand in the evolution of diverse colours and markings, but it was not the sole agency. The tendency to explain all problems by the theory of natural selection is to-day greatly retarding the study of bionomics. It is not one whit removed from the proffered explanation of the old teleologists, and represents as little

\* 'Across East African Glaciers,' p. 79.—Other travellers in South Africa have noticed an absence of game among ant-hills. Thus Andrew Steedman states: "We remarked that, where they most abounded, Antelopes and other species of gregarious animals were seldom to be met with" ('Wand. and Advent. in Int. S. Africa,' vol. i. p. 172).

† 'The Sportsman in South Africa,' p. 46.

thinking. This has naturally not escaped the thoughtful consideration of Mr. Wallace, though he seems inclined to ascribe the early uniform colouration to a protective origin,\* whereas it is difficult to see that the same hue was equally protective to friend and foe, to the devourer and devoured.

A fact, however, which very strongly stands against the view of original assimilative colouration here assumed is found in the markings of the young of all the unicolorous cats,—Lion, Puma, &c.,—which are more or less indistinctly spotted or striped, and as many allied species, both young and old, are similarly marked, Darwin has observed that “no believer in evolution will doubt that the progenitor of the Lion and Puma was a striped animal, and that the young have retained vestiges of the stripes, like the kittens of black Cats, which are not in the least striped when grown up. Many species of Deer, which when mature are not spotted, are whilst young covered with white spots, as are likewise some few species in the adult state.”† If this was a concrete fact, it would be fatal to the suggestion here made, but the evidence is not all one way, for, according to the late Prof. Kitchen Parker, in the Hunting Leopard (*Cynælurus jubatus*) the young “are covered with soft brown hair, without spots, quite reversing the usual order of things”‡; and Col. Pollok states the same thing.§ However, *per contra*, Mr. Lydekker observes: “It is stated that if a cub in this state be clipped, the under fur will exhibit distinct spotting.”|| In the Lion the markings are also foetal, for Steedman, quoting the particulars of a Lion hunt from the pages of the ‘United Service Journal’ (August, 1834),

\* “The fundamental or ground colours of animals are, as has been shown in preceding chapters, very largely protective, and it is not improbable that the primitive colours of all animals were so. During the long course of animal development other modes of protection than concealment by harmony of colour arose, and thenceforth the normal development of colour due to the complex chemical and structural changes ever going on in the organism had full play; and the colours thus produced were again and again modified by natural selection for purposes of warning, recognition, mimicry, or special protection” (‘Darwinism,’ p. 288).

† ‘The Descent of Man,’ 2nd edit., p. 464.

‡ ‘Cassell’s Nat. Hist.,’ vol. ii. p. 78.

§ ‘Zoologist,’ 4th ser. vol. ii. p. 163.

|| ‘Roy. Nat. Hist.,’ vol. i. pp. 443–4.

relates of a Lioness that was killed, "she had four unborn whelps, with downy skins, striped like the Tiger."\* It still appears that the young of many unicolorous animals are spotted. "Pigs and Tapirs are banded and spotted when young; an imported young specimen of *Tapirus bairdi* was covered with white spots in longitudinal rows, here and there forming short stripes. Even the Horse, which Darwin supposes to be descended from a striped animal, is often spotted, as in dappled Horses; and great numbers show a tendency to spottiness, especially on the haunches."†

Similar markings are to be found in the young of many fishes. Larval Cod have black transverse bars, "the stellate black chromatophores arranged in bands are clearly indicated."‡ Young Ling (*Molua molva*), when grown to a length of seven inches, pass through a very distinct barred stage.§ The young of all the Salmonidæ are barred; "and this is so constantly the case that it may be used as a generic, or even as a family character, not being peculiar to *Salmo* alone, but also common to *Thymallus*, and probably to *Coregonus*."|| When the fry have attained a length of some four inches, they are known by the name of "parr," and "bear conspicuously on their bodies transverse marks or bars, which are common to the young of every member of the Salmon family."¶ Even as regards the colouring of British land and freshwater Mollusca, the view has been held that *Helix cantiana*, *H. cartusiana*, &c., were once banded species.\*\*

Taking the cases of the Lion, Puma, and Cheetah, we see that the two first, unicolorous in their adult stage, apparently show by their spotted young a derivation from a similarly coloured ancestor, whilst the spotted Cheetah, from the apparent evidence of its unicolorous young, would point to a totally different conclusion. But the cumulative opinion of evolutionists is that all

\* 'Wand. and Advent. in Int. S. Africa,' vol. i. p. 220.

† A. R. Wallace, 'Darwinism,' p. 290.

‡ McIntosh and Masterman, 'Life-histories Brit. Marine Food Fishes,' p. 238.

§ *Ibid.* p. 33, fig. 8, and p. 281.

|| 'Roy. Nat. Hist.,' vol. v. p. 494.

¶ *Ibid.* p. 497.

\*\* Cf. "Val. Address," 'Journ. Conch.,' April, 1888; and Boycott, 'Zoologist,' 3rd ser. vol. xx. p. 62.

spots, stripes, and other prominent markings, have been intensified, preserved, or made permanent by a selective process, and have become, and are, of the greatest utility to the animals which possess them. Eimer, on the contrary, from the evidence of the markings on Cats and Dogs, is inclined to ascribe such markings as "due to external conditions and an internal direction of evolution, and can be acquired and inherited in spite of all pammixes"\*—cessation of selection, or the present non-importance of such characters in the struggle for existence. Mr. A. Tylor's views ('Colouration of Animals and Plants'), as summarized by Mr. Wallace, were that the primitive form of ornamentation consisted of spots, the confluence of these in certain directions forming lines or bands; and these again sometimes coalescing into blotches, or into more or less uniform tints covering a large portion of the surface of the body.† It seems, however, more in consonance with present knowledge and opinion to consider that spots, though primitive, were not original, and succeeded, not preceded, unicolorous ornamentation, which has survived only where it has been more or less in unison with the creature's environment, and so afforded "aggressive protection," as in the case of the Lion. Some of the best observations on this point are often made by travellers who know little of the subject, are not zoologists, have no preconceived ideas, but possess a clear mind with which to observe common facts. Such an observation on the colour of the Lion is to be found in a recent book written by two ladies recounting their experiences in Mashonaland:—"His coat was soft and bright, and of a tawny colour—not unlike that of a mastiff—with black points. This colour is so like that of the sun-dried grass, that it can with difficulty be distinguished from it."‡ If, however, it may be considered as rash to speculate on an original unicolorous or

\* 'Organic Evolution,' pp. 115-16.

† 'Darwinism,' p. 289. Among the Weasels (Mustelidæ), "there is a tendency for the different colours to arrange themselves in longitudinal lines or patches, so as to make the whole of the upper surface of the body light, and its under surface dark; and in no case are there either spots or transverse bands of colour, while equally noteworthy is the entire absence of alternating dark and light rings of colour in the tail" (Lydekker, 'Roy. Nat. Hist.,' vol. ii. p. 47).

‡ 'Advent. in Mashonaland by two Hospital Nurses' (Col. Edit.), p. 277.



assimilative colouration, it seems even more opposed to evolutionary ideas to predicate that because a mammal, as we know it at the present time, has a striped coat, it had also the same appearance in past geological epochs. Yet this seems to have been the method of Prof. Heilprin, who has written so excellently on the distribution of animals, considered geologically as well as geographically. Thus we read:—"The striped Hyena may be traced back to the older (Pliocene) *H. arvennensis* of Central France, and the brown form not improbably to the Miocene (or Pliocene) *H. exima* of Pikermi, Greece."\* At the present day we have brown, spotted, and striped Hyenas (*H. brunnea*, *H. crocuta*, and *H. striata*) all found in, though not confined to, the continent of Africa, and however they may differ osteologically, and however distinctly these differences may be detected in fossil forms, yet surely we are not warranted in concluding that identity of colouration has survived from the geological past. But speculating on the generally accepted conclusion that spots and stripes succeeded a uniform or concolorous decoration, and remembering that the three forms of markings referred to can almost be found at the present time, it seems we ought to be very cautious, as evolutionists, in concluding that the Hyena had developed either spots, or stripes, in Miocene or Pliocene times. Remembering the numerous remains of the genus found in the Pleistocene deposits of Europe, and that, as Prof. Heilprin remarks, it was from these north temperate regions "the Ethiopian realm has drawn much of its existing distinctive fauna," and that the widely distributed Cave Hyena (*H. spelæa*), if not identical with the present spotted form (*H. crocuta*), was "without doubt its direct ancestor," it remains a suggestion as to what the original colouration was, altogether apart from structural specific distinction. Among the fossils of Pikermi, Gaudry found the successive stages by which the ancient Civets passed into the more modern Hyenas.†

\* 'Geograph. and Geolog. Distrib. Animals,' p. 386. Prof. Boyd Dawkins likewise includes the "Spotted Hyena" (*H. spelæa*) in his list of mammalia occurring in Great Britain in association with Palæolithic implements in the Pleistocene river deposits and the caves" ('Journ. Anthropol. Instit.,' vol. xviii. p. 243).

† Huxley, 'Collected Essays,' vol. ii. p. 241.

If the view of original assimilative colouration is reasonable and probable, then it should receive support from the generally understood derivation of spots and stripes by a process of "natural selection," though, as we suggest, and as will be explained later on, natural selection must be regarded as a permitting and perpetuating force, rather than as a creative agency.\* Two instances will here suffice for a consideration of this point in colouration, and are both based on the observations of two competent and excellent observers. The first relates to that prominently striped animal the Zebra, and was made by Mr. F. Galton:—"No more conspicuous animal can well be conceived, according to common idea, than a Zebra; but on a bright starlight night the breathing of one may be heard close by you, and yet you will be positively unable to see the animal. If the black stripes were more numerous he would be seen as a black mass; if the white, as a white one; but their proportion is such as exactly to match the pale tint which arid ground possesses when seen by moon-light."† The second observation was made by that renowned sportsman, General Douglas Hamilton, and relates to the Spotted Deer and Tiger in India:—"For example, the Axis, or Spotted Deer as it is generally called, is something like the Fallow Deer in colour, only the white spots and markings are more distinct, and the body is a brighter red; one would imagine such a conspicuous animal could be easily distinguished in the forest, but the spots and colour so amalgamate with the broken lights and shades that I have often taken a shot at which I thought was a solitary Spotted Deer, and have been astonished to see ten or twelve dash away. The Tiger, again, with his bright body, black stripes, and white markings, is most difficult to see in the forest, and even on the open hill side; at three hundred or four hundred yards distant not a stripe is distinguishable. More than once I have mistaken a Tiger for a light-coloured hind Sambur, until I have brought the telescope to bear and seen my mistake."‡ General Kinloch, as quoted by Lydekker, referring

\* "The origin of protective colours is to be sought in fortuitous variation preserved by selection" (Dr. Hart Merriam,—Balt. Meet. Am. Soc. Nat.,—*vide* 'Science,' new ser. vol. i. p. 38).

† 'Narr. Explor. in Trop. S. Africa' (Minerva Lib. Edit.), p. 187.

‡ 'Records of Sport in Southern India,' p. 41.

to the Spotted Deer, says, "unless it moves, few beasts are more difficult to see; the colour of the skin harmonizes with the dead leaves and grass, while the white spots are indistinguishable from the little flecks of light caused by the sunshine passing through the leafy branches."\* These observations have the great merit of being neither the result of preconceived opinion, nor the effort to support a theory. Mr. Galton's journey was made during the years 1850-2, before the advent of that epoch-making work the 'Origin of Species,' which at once rivetted attention on all these phenomena. General Douglas Hamilton simply recorded the impressions of a sportsman with thirty-five years' experience in India. Such testimony cannot be gainsaid, and though numerous other illustrations could readily be compiled, and from the pens of capable observers, those here given will suffice as regards the standard of competence and accuracy. On the other hand, I was surprised, in reading the 'Travels and Adventures in South East Africa' of that celebrated and experienced hunter, Mr. P. C. Selous, that he seemed to have no similar observations to record.

In reference to the above instances of spots and stripes affording concealment, the explanation of "active mimicry," as I hope to advocate subsequently, might be applied; but then it must be remembered that the same phenomenon is found in other animals who live under very different conditions. Thus the Zebra Shark (*Stegostoma tigrinum*) is marked with black or brown transverse bars or round spots. Again, in Australia, according to Prof. Strong, the Rabbit is not only often parti-coloured, but numerous instances occur not only of white and black Rabbits, but of Rabbits "with beautifully striped skins."†

The origin of spots and stripes is shrouded in obscurity. In domesticated animals, such as Dogs, Cats, cattle, and Horses, unsymmetrical markings constantly occur. According to Mr. Wallace, "Such markings never occur in wild races, or if they occur in individual cases they never increase; and I have given

\* 'Roy. Nat. Hist.,' vol. ii. p. 355.—Livingstone seems inclined to the opinion that such animals take refuge in the forest to escape from the hunters: "But here, where they are killed by the arrows of the Balonda, they select for safety the densest forest, where the arrow cannot be easily shot" ('Missionary Travels and Researches in South Africa,' p. 280).

† 'Zoologist,' 3rd ser., vol. xviii. p. 406.

reasons for thinking that symmetrical colour and marking is kept up in nature for facility of recognition, a factor essential to preservation and to the formation of new species.”\* Mr. Bateson combats the view that variability of domestic animals is markedly in excess of that seen in wild forms. He adduces the great variability of the teeth of the large Anthropoids compared with the rarity of variations in the teeth of other Old World Monkeys, and the *comparative* rarity of great variations even in man:—“If the Seals or Anthropoids had been domesticated animals, it is possible that some persons would have seen in their variability a consequence of domestication.”† As regards colour, the same author is more emphatic. To use his own example:—“I go into the fields of the north of Kent in early August, and sweep the Ladybirds off the thistles and nettles of waste places. Hundreds, sometimes thousands, may be taken in a few hours. They are mostly of two species, the small *Coccinella decempunctata* or *variabilis* and the larger *C. septempunctata*. Both are exceedingly common, feeding on Aphides on the same plants in the same places at the same time. The former—*C. decempunctata*—shows an excessive variation both in colours and in pattern of colours, red-brown, yellow-brown, orange, red, yellowish white, and black in countless shades, mottled or dotted upon each other in various ways. The colours of Pigeons or of cattle are scarcely more variable. Yet the colour of the larger *C. septempunctata* is almost absolutely constant, having the same black spots on the same red ground. The slightest difference in the size of the black spots is all the variation to be seen. (It has not even that dark form in which the black spreads over the elytra until only two red spots remain, which is to be seen in *C. bipunctata*.) To be asked to believe that the colour of *C. septempunctata* is constant because it matters to the species, and that the colour of *C. decempunctata* is variable because it does not matter, is to be asked to abrogate reason.”‡

If we consult Mr. Gladstone's ‘Impregnable Rock of Holy Scripture,’ we shall be induced to believe that such markings may have arisen by a partial or further process of assimilative

\* ‘Nature,’ vol. L. p. 197.

† ‘Materials for the Study of Variation,’ p. 266.

‡ *Ibid.* p. 572.



colouration. According to the Biblical narrative, the astute Jacob in his negotiations with Laban increased the number of "ringstraked, speckled, and spotted" cattle by the following ingenious method. He "took him rods of green poplar, and of the hazel and chestnut tree; and pitted white strakes in them, and made the white appear which *was* in the rods. And he set the rods which he had pitted before the flocks in the gutters in the watering troughs when the flocks came to drink, that they should conceive when they came to drink. And the flocks conceived before the rods, and brought forth cattle ringstraked, speckled, and spotted."\* This narrative might be used as a theological argument for the theory that wild animals may have acquired their spots and stripes in a similar manner, as the Tiger in his bamboo jungle, &c., and it seems strange in these plentiful days of theory that no clerical evolutionist has advanced such a view. Canon Tristram, however, by his observations in the Sahara, does not advocate this suggestion, for in these desert plains he described sheep in which "Jacob's ringstraked and speckled, dappled with white, and especially light brown predominated."†

Another suggestion, to which allusion has already been made, is that of the late Alfred Tylor, who starts with the premiss that it "seems most probable that the fundamental or primitive colouration is arranged in spots,"‡ and that these are capable of being coalesced into bands, stripes, and blotches, and are structural in affinity. "If we take highly decorated species, that is, animals marked by alternate light and dark bands, or spots, such as the Zebra, some Deer, or the carnivora, we find first that the region of the spinal column is marked by a dark stripe; secondly, that the regions of the appendages, or limbs, are differently marked; thirdly, that the flanks are striped or spotted along or between the regions of the lines of the ribs; fourthly, that the shoulder and hip regions are marked by curved lines; fifthly, that the pattern changes, and the direction of the lines, or spots, at the head, neck, and every joint of the limbs; and lastly, that the tips of the ears, nose, tail, and feet, and the eye

\* Genesis, chap. xxx. verses 37-9. In the following chapter—xxxi. verses 10-13—this is altogether attributed to the favour of the God of Bethel.

† 'The Great Sahara,' p. 61.

‡ 'Colouration in Animals and Plants,' p. 23.

are emphasized in colour. In spotted animals the greatest length of the spot is generally in the direction of the largest development of the skeleton." \* Mr. Tylor had assuredly not read an African observation made by the late Dr. Livingstone, or he would have as certainly incorporated it in his essay as evidence for his theory, and which it may be almost said to have partly anticipated. Dr. Livingstone writes:—"The Poodle Dog Chitané is rapidly changing the colour of its hair. All the parts corresponding to the ribs and neck are rapidly becoming red; the majority of country Dogs are of this colour." † Emin Pasha does not corroborate this statement of Livingstone respecting the markings of Central African Dogs. He describes them as "usually of a buff colour." ‡ As regards the reddish colour of the Central African Dogs as described by Livingstone, it must be remembered that many domesticated Dogs are considered to have been the result of taming different wild species of *Canidæ*, and that the Black-backed Jackal (*Canis mesomelas*), which is found from Nubia to the Cape, has a light red skin with a black dorsal stripe. According to Lydekker, in the Prairie Wolf of North America (*Canis latrans*), "the colour varies considerably at different seasons of the year, being of a bright fulvous-brown in summer, and grey or greyish in winter; this ground colour at both seasons being overlaid with a shading of black, which tends to form stripes along the back and across the shoulders and loins." § Another peculiarity in African Dogs has been recorded by Blumenbach:—"The Guinea Dog (which Linnæus calls *C. ægyptius*—I do not know why) is, like the men of that climate, distinguished for the velvety softness of his smooth skin, and the great and nearly specific cutaneous perspiration." || Darwin, discussing the animals under consideration, is inclined to ascribe spots and stripes as due to his theory of "sexual selection," the ornamentation having firstly been acquired by the males, and then transmitted equally, or almost equally, to both sexes. He adds: "After having studied to the best of my ability the sexual differences of animals

\* 'Colouration in Animals and Plants,' p. 92.

† 'Livingstone's Last Journals,' vol. i. p. 95.

‡ 'Emin Pasha in Central Africa,' p. 80.

§ 'Roy. Nat. Hist.,' vol. i. p. 501.

|| 'Anthropological Treatises,' Eng. transl. p. 191.

belonging to all classes, I cannot avoid the conclusion that the curiously-arranged colours of many Antelopes, though common to both sexes, are the result of sexual selection primarily applied to the male." \* And he subsequently remarks: "Nevertheless, he who attributes the white and dark vertical stripes on the flanks of various Antelopes to this process will probably extend the same view to the royal Tiger and beautiful Zebra." † Mr. Wallace estimates the derivative process of spots and stripes as a purely protective one:—"In mammalia we notice the frequency of rounded spots on forest or tree-haunting animals of large size, as the forest Deer and the forest Cats; while those that frequent reedy or grassy places are striped vertically, as the Marsh Antelopes and the Tiger." And again: "It is the black shadows of the vegetation that assimilate with the black stripes of the Tiger; and in like manner, the spotted shadows of leaves in the forest so harmonize with the spots of Ocelots, Jaguars, Tiger-cats, and Spotted Deer, as to afford them a very perfect concealment." ‡ This last view seems borne out by all the facts at our disposal, and as adaptation implies a previous state of variation, which again predicates a more or less stable condition from which variation arose, we come to the conclusion that the pre-variable condition was a unicolorous one, and from the data—scanty indeed—at our disposal, are inclined to suggest that the unicolorous hue was originally due to assimilative colouration. The wild Horse of Asia is said to be of a dun colour, while those of South America are described as commonly chestnut or bay coloured. § Why is this?—the question bristles with present difficulties. In the writings of pre- and anti-Darwinian naturalists are often found remarks and statements unconsciously supportive of the future theory. Thus Charles Waterton, in describing the faunistic features of the Demerara forest, writes: "The naturalist may exclaim that nature has not known where to stop in forming new species, and painting her requisite shades" ||; while Frank Buckland from a teleological point of view had pointed out that the striped coat of the Tiger was "most suited" to his environ-

\* 'Descent of Man,' 2nd edit. p. 544.

† *Ibid.* p. 546.

‡ 'Darwinism,' pp. 199, 200.

§ Huxley, 'Collected Essays,' vol. ii. p. 426.

|| 'Wanderings,' Wood's edit. p. 94.

ment, and "when skulking through the dark shade, either of corinda or jungle, it would be almost impossible to make out his huge cat-like carcass creeping along like a silent shadow."\* Eimer also observes:—"I have permitted myself to express the supposition (Varüren, &c.) that the fact of the original prevalence of longitudinal striping might be connected with the original predominance of the monocotyledonous plants whose linear organs and linear shadows would have corresponded with the linear stripes of the animals; and further, that the conversion of the striping into a spot-marking might be connected with the development of a vegetation which cast spotted shadows. It is a fact that several indications exist that in earlier periods the animal kingdom contained many more striped forms than is the case to-day."† To even fancy the appearance of animal and plant life in past geologic epochs, apart from structure as revealed by palæontology, is left to sober scientific imagination. We know there was a flowerless age, but even then animal life existed. Is it to be argued that such animal life had reached its development in colouration? Can we not more easily imagine that animals assimilated in colour with the monotonous and semi-sombre hues of their then environment; but as they multiplied and the struggle for existence caused migration, the same inherent tendency to assimilative colouration prompted assimilative variation in response to the difference in surrounding conditions, and when this variation became adaptive and protective, the process of natural selection accentuated and perpetuated whatever was advantageous to the creature's existence.

The late Andrew Murray, in a paper read before the British Association in 1859, and just before or coincident with the appearance of Darwin's 'Origin of Species,' appears to have held a similar impression, though not reaching the explanation of "natural selection." His words well serve to conclude this discursive suggestion of original and universal assimilative colouration:—"We have seen that in all the instances to which I have referred, the external appearance of the animal bears definite relation to the appearance of the soil on which it lives, or the objects which surround it. It would appear as if there

\* 'Curiosities of Natural History,' Pop. Edit., 3rd ser., p. 256.

† 'Organic Evolution,' Eng. transl. p. 57.



were a *genius loci*, whose subtle and pervading essence spread itself around, penetrating and impregnating the denizens of the place with its *facies*,—possibly only affecting some, the conditions of whose entry on existence render them more liable to receive its impression than others; more probably affecting all, some more and some less," &c.\* It may, however, be suggested that this adaptive colouration was due to an assimilative process in early times,† and that the "*genius loci*" is a pseudonym of that operation. It is at least probable that where we have protective resemblance in a unicolorous condition, it is a survival of original assimilative colouration, and is not a direct product of "natural selection"; but is ratified and perpetuated by that agency as agreeing altogether with its conditions. Unchanged it has survived as the fittest.‡ It must have been in the original head-quarters or centre of evolution before migration took place, and a uni- or concolorous hue prevailed. Such a centre for Anthropoids, palæontology proves to have once existed in India. In the words of Mr. Lydekker:—"We have decisive proof that at a former epoch of the earth's history such an assembly of Primates was gathered together on the plains of India at a time when the Himalaya did not exist as has been seen nowhere else beyond the walls of a menagerie. Side by side with Langurs and Macaques closely resembling those now found in that region were Chimpanzees and Baboons as nearly related to those of modern Africa, whilst the extinct Indian Orang recalls the existing species of Borneo and Sumatra. India, therefore, in the Pliocene period, seems to have been the central point whence the main groups of Old World Primates dispersed themselves to their far distant homes."

\* "Disguises in Nature," *vide* 'Edinburgh New Philosoph. Journ.,' January, 1860.

† Eimer proposes a theory of colour-photography: "The colours of the environment of an animal may be reflected in the colours of its skin" ('Organic Evolution,' Eng. transl. p. 145).

‡ A different argument, propounded on somewhat similar grounds, was advanced by Agassiz in his "Natural Relations between Animals and the Elements in which they live," to prove that marine animals were less specialised in structure than those inhabiting the land areas (*vide* Silliman's 'Amer. Journ. Sci. and Arts,' May, 1850).

## THE BIRDS OF THE RIFFELALP, CANTON VALAIS, SWITZERLAND.

By P. L. SCLATER, M.A., Ph.D., F.R.S.

LAST September I passed eight very pleasant days, in splendid weather, at the excellent hotel on the Riffelalp, Zermatt, at a height of 7300 ft. above the sea-level. The hotel is situated close to a large grove of mixed larches and arolla pines (*Pinus cembra*), and just opposite the Matterhorn. It is well known as one of the most popular mountain resorts in Switzerland, and has been now rendered very accessible by the new electric railway, which puts you down at its door. I cannot truly say that bird-life is abundant on the Riffelalp, or, in fact, in any other part of the Swiss Alps that I know of. But there are several birds there not to be seen in life in the British Islands, and of special interest to the student of European ornithology.

You cannot go very far into the pine forest adjoining the hotel without meeting with the Nutcracker (*Nucifraga caryocatactes*). A harsh croak is heard, and a blackish brown Jay-like bird with a conspicuous white tail-end tumbles out of a tree and flies hurriedly into another, often followed by one or more companions. They seem specially fond of the arollas or arvens (*Pinus cembra*), upon the seeds of which they habitually feed, picking the cones into fragments in search of them. I have also seen them on the larch and on the spruce, and occasionally on the open moor. The Nutcracker is certainly the most characteristic bird of the higher forests in Switzerland—that is, from 8000 to 10,000 ft.—and seems to be met with in nearly all the pine forests of that elevation.

Another attractive bird of the Alps is the Alpine Chough (*Pyrrhocorax alpinus*), which may be seen in flocks in many of the precipitous cliffs of the higher mountains. There is a large company of them on the Görnegrat above the Riffelalp (alt. 10,200 ft.), where they inhabit the southern face of the jagged

rocks overlooking the Görner Glacier. They are continually on the move, uttering as they fly about a sort of subdued cackle, and making elegant evolutions in the air. At times they retreat into the ragged rocks, in the holes of which they no doubt build their nests. Another smaller company of this Chough inhabits the steep cliff between the Riffelalp inn and the Riffelhaus.

There was a pair of Ravens on the Görnergrat during one of my visits, which seemed to be on the best of terms with the Choughs, and headed them in their evolutions as they flew about.

A third delightful little bird of the Riffelalp is the Alpine Accentor (*Accentor alpinus*), which is hardly known as a "British bird," but may be easily recognized by those who trouble to look for it among the highest ranges in Switzerland. Although it is unquestionably allied to our so-called "Hedge-sparrow," its habits are quite different, and are more like those of the Pipits or Stonechats. I have always seen it in pairs or small flocks, or sometimes singly, picking about on the ground amongst large stones, or perching on rocks and running over their surfaces. On one occasion I found a family party of six or seven within two hundred yards of the Riffelalp hotel. They are usually rather shy, and it is difficult to get one's glasses well fixed on them, so lively are their movements; but when you get a good side light on them the spotted throat and rufous tinge on the flanks render them easily distinguishable.

The Snow-finch (*Montifringilla nivalis*) is also a characteristic bird of the high Alps from 8000 to 10,000 ft. I have seen small flocks of them on the Furka Pass and elsewhere. On the Riffelalp this year I only identified a single bird with certainty; this was on the outskirts of the pine wood near the hotel. But another flock of finches which I saw in the same neighbourhood near Findelen Glacier was, I believe, of this species.

In the open parts of the highest pastures on the Riffelalp the Water Pipit (*Anthus spinoletta*) is by no means rare. They are always seen on the ground, taking a short flight when disturbed, and then settling again in the herbage. Their habits appeared to me to be much the same as those of our Meadow Pipit (*A. pratensis*).

The Black Redstart (*Ruticilla tithys*), common all over Switzerland, is also to be found on the Riffelalp, but does not

seem to range quite so high as the five species previously mentioned. It is usually met with in the vicinity of the huts and hay-barns, under the eaves of which it often breeds.

Thus it will be observed that there are at least six most interesting alpine birds to be met with on the Riffelalp, even by one who pays merely a few days' visit to that most inviting health resort in one of the worst months of the year as regards bird-life. I have no doubt that all these species would be found breeding there in the spring. Besides these, I noticed Chaffinches, flocks of Tits in the pine woods (*Parus lugubris* and *P. cristatus*), and other well-known birds which it is not necessary to mention. Birds of prey, however, seemed to be unusually scarce. I heard rumours of an Eagle (?), but only saw a single Sparrowhawk.



## NOTES AND QUERIES.

## MAMMALIA.

## RODENTIA.

**Large Bank Vole in Kent.**—On Oct. 5th, Mr. Oxenden Hammond, of St. Alban's Court, Wingham, very kindly sent me the largest specimen of *Microtus glareolus* that I have ever seen. It was a female, and without any undue stretching measured  $6\frac{1}{2}$  in. from tip of nose to tip of tail; length of head and body,  $4\frac{1}{2}$  in.; length of tail, 2 in. Bell gives the length of the head and body of the female as 3.40 in., and of the tail 1.50 in. Unfortunately when it reached me it was much too far gone for preservation; it was evidently suckling young, and this would hasten on decomposition. —OXLEY GRABHAM (Heworth, York).

## AVES.

**Economy of the Cuckoo.**—There are one or two points in Mr. H. S. Davenport's interesting notes on the economy of the Cuckoo on which I should like to make a few remarks. During the last eight seasons I have myself taken from the nests in which they were deposited thirty eggs of the Cuckoo, but in no case was there any material difference in the period of incubation of the Cuckoo's egg and those of the foster-parent. I never found more than one Cuckoo's egg in a nest; three were with five eggs of the owner, ten with four, six with three, five with two, and four with one. One was in a nest with two flourishing young Hedge-sparrows, the young Cuckoo being dead and partly decomposed in the shell, and one was found with no other egg under somewhat exceptional circumstances. About the middle of June, 1895, I saw a Cuckoo very near an ivy wall in our garden, from which an egg had been taken with a clutch of Pied Wagtail about a fortnight before, and, happening to have a Greenfinch's nest with fresh eggs by me, I carefully placed this nest with three eggs in it in the ivy. About two days after I found two of the eggs were gone, one of which lay broken on the ground below; and on the following day the last egg had been removed, a Cuckoo's egg being left in its stead. I have tried the same experiment since, but without success. Of the thirty eggs referred to above, nine were from nests of the Sedge Warbler, seven from Pied Wagtail, six from Hedge-sparrow, one each from Thrush, Robin, Blackcap, White-

throat, Spotted Flycatcher, Reed Bunting, and Greenfinch, the thirtieth being the one from the nest put up. We have no Meadow Pipits here, and though I have seen *in situ* more than twenty nests of its congener, the Tree Pipit, not one has contained a Cuckoo's egg or young. Last year, on July 8th, a farm-lad brought me a Cuckoo's egg, and, on asking him where the other eggs in the nest were, he told me there were two lately-hatched young Hedge-sparrows in the nest, which he had not disturbed. If his story were true (and I have no reason to doubt it), this Cuckoo's egg was deposited after the incubation of the other eggs had begun. It was within two or three days of hatching. An inspection of our series of Cuckoo's eggs here would, I think, go some way to prove that the same hen Cuckoo does not always lay in the nests of the same species, as we have eggs apparently of the same bird from the nests of the Hedge-sparrow and the Thrush; of another from the Hedge-sparrow and the Sedge Warbler; of another from the Hedge-sparrow and the Whitethroat, taken from the same ditch on the same day; and of another from the Sedge Warbler and the Reed Bunting. In each instance the resemblance of the eggs is very close, the date approximate, and the locality the same. I have recently met with an undoubted case of removal of one or more eggs while watching a Sedge Warbler's nest in a locality where Cuckoos abound. When I found the nest it was empty; on June 22nd it contained two eggs of the owner, and on June 25th only one egg of the owner and one of the Cuckoo. In conclusion, I may add that it seems to me impossible to ascertain the number of eggs laid by one of these erratic birds in the course of a season; but this year I have had five saved for me, all from nests of the Hedge-sparrow, and all undoubtedly laid by the same bird within an area of two square miles. The first was taken quite fresh on May 11th or 12th, and the last (also fresh) on June 5th.—JULIAN G. TUCK (Tostock Rectory, Suffolk).

**Economy of the Cuckoo.**—Mr. H. S. Davenport may be interested to hear, in connection with the above, that I had brought to me a Meadow Pipit's nest taken on June 30th on one of our Yorkshire moors, where Cuckoos and Meadow Pipits swarm, and that the nest contained a perfectly fresh egg of the Cuckoo; but the Pipit's eggs were so much incubated that I only succeeded in blowing one of them.—OXLEY GRABHAM.

**The Cirl Bunting in Breconshire.**—At the present time the Cirl Bunting (*Emberiza cirrus*) is a firmly established resident in this county, and is to be found in at least five or six localities. Mr. Howard Saunders, in his 'Manual of British Birds,' states that this species, he believes, was unknown in Wales until Mr. E. C. Phillips obtained one on March 15th, 1888, near Brecon; and, as most of our bird books describe it as being rare except in the South of England, perhaps a few notes as to its status in this county may be

of interest. I first observed it on a hill-side named Sunnybank, which rises from the back of my house, on June 4th, 1890, when I found a nest containing four eggs, at the same time identifying the sitting bird as a Cirl Bunting. A few days afterwards I heard two male birds of the same species in song near the site of the nest. One of these I shot, and it is now in my collection. Since that date it has become resident on the above-named bank, where it nests yearly, and where I hear its song almost daily during the summer. Since that year it has also been gradually spreading over the county, and nearly every summer its song is to be heard in some fresh locality. It seems partial to hill-sides furnished with gorse and isolated elm and oak trees. The following are some of the places where it occurs, and probably nests: High Grove, Tallylyn, Sennybridge, and Glanusk. I have obtained several specimens for myself and friends; a pair in my collection are in full adult plumage, and a bird which I obtained for the Hereford Museum is an immature male with breast colour bands not well marked. Of four Cirl Buntings' nests I have found here two were in gorse bushes, one on a bank among coarse herbage, and one in a bramble. The eggs in my collection, which I took here from three nests, are all of the same type, and have a greenish white ground, boldly marked with blackish streaks and spots. They are distinct, and could not well be mistaken for eggs of any other of our birds. The Cirl Bunting is one of our most persistent songsters; its monotonous metallic trill is to be heard from about the first week in April to the middle of August. When I first heard it the trill seemed to me rather like that of the Lesser Whitethroat; I am of the opinion now, however, that the song of the latter is more musical and softer. Singing as it does generally near the top of a tree and often out of sight, it is much more easily recognized by the ear than the eye.—E. A. SWAINSON (Woodlands, Brecon).

**Spotted Crake in Furness.**—The Spotted Crake (*Porzana maruetta*) is perhaps sufficiently rare in that portion of Lakeland known as Furness to make the occurrence of a couple in the Rusland Valley worthy of record in 'The Zoologist.' I have searched for this species for a dozen years or more here, where Water Rails may frequently be seen, in the confident expectation of finding the rarer bird sooner or later. On Sept. 8th I saw two, which were shot. They proved on dissection to be male and female, and from the orange-red on the bills are no doubt old birds (*cf.* Stevenson, 'Birds of Norfolk,' vol. ii. p. 395). Both birds, flushed separately from aquatic herbage, took short flights, and were shot as they were just dropping into thick cover. The food consisted of several small seeds and finely divided vegetable matter. On the wing they do not resemble Water Rails, but are much more like tiny Moorhens, and they fly rather fast. Since writing the above, another Spotted Crake has been shot, on Oct. 10th, in exactly the same place. It

is a young bird, readily distinguished from the adults by the absence of bright orange-red on the beak. It is thus not beyond the bounds of possibility that a brood was reared in the immediate vicinity.—CHARLES F. ARCHIBALD (Rusland Hall, Ulverston).

**Pectoral Sandpiper in Kent.**—I had the pleasure of exhibiting, at the last meeting of the British Ornithologists' Club, the first Kentish specimen of the Pectoral Sandpiper (*Tringa maculata*). The bird was shot, from a flock of Dunlin, on Aug. 2nd last, along the seashore between Lydd and Rye Harbour; it is an adult male, and its dimensions agree almost exactly with those of Mr. Gurney's Norfolk specimen given in Stevenson's 'Birds of Norfolk,' vol. ii. p. 370. The bird is the property of Mr. Whiteman, of Rye, to whom I am indebted for allowing me to examine and exhibit it.—N. F. TICEHURST (Winstowe, St. Leonards-on-Sea).

**Notes on the Nesting of the Nuthatch.**—In this district at all seasons of the year the Nuthatch (*Sitta cæsia*) is tolerably abundant, and for years past I have annually, and in some instances accidentally, discovered the nests of from twelve (minimum) to twenty or more of this species; the past breeding season I paid more attention to the loud "twit twit" of this bird as it darted rapidly from branch to branch, resting occasionally to peep at the bold intruder who ventured so near the favoured breeding place. By remaining perfectly still for a short time, the nest was in most cases easily discovered, and I can safely and unmistakably assert that the Nuthatch (*Sitta cæsia*) does not in every instance, as is generally supposed, fill up the selected natural cavity, whether in tree or wall, with clay and stones; out of nineteen nests found by me this year, situated from three to twenty feet from the ground, only two possessed the clay; one of these had, in addition to the clay, a quantity of small particles of stone plastered against the bole surrounding the nesting hole. All the others had not the slightest sign of mud, clay, or stones. The eggs, removed by the aid of a specially constructed spoon, were again replaced upon the loose nesting material, and occasionally resembled boldly blotched specimens of *Parus major*. At every nest I identified one or the other of the parent birds. Sometimes by gently tapping near a suspicious-looking hole, the sitting bird would quickly leave its nest and call its mate, hitherto unheard, with that unmistakable and quickly repeated "twit twit" of the species. At one nest visited late in the evening, and containing young, both parent birds entered the nesting hole, and, after remaining quietly until long after the Nightjar had commenced his evening "churr," I retired from the spot, concluding that in this instance at least the Nuthatch had not gone to roost back downwards.—STANLEY LEWIS (Mount Pleasant, Wells).

**Irregular Nesting Sites.**—In corroboration of Mr. Stanley Lewis's



note in the October issue of 'The Zoologist,' there is at times an undoubted tendency on the part of sundry birds to appropriate for breeding purposes nests to which they have no rightful claim, though I do not say that such tendency is possessed by very many species, nor that it is illustrated with undue frequency. At p. 74 of 'The Vertebrate Animals of Leicestershire and Rutland' will be found a note having reference to a Spotted Flycatcher (*Muscicapa grisola*) which reared two successive broods in a Chaffinch's (*Fringilla cœlebs*) nest at Ashlands, in this county, in the spring of 1883; while in the same work, at p. 65, I have given a brief account of a Blue Tit's (*Parus cæruleus*) nest, found in June of the same year, which contained nine eggs, and was placed inside the ancient habitation of a Song Thrush (*Turdus musicus*). In the former instance the Spotted Flycatcher had merely usurped a forsaken nest, utilising it just as it came to hand. It was otherwise, however, in the case of the Blue Titmouse.

Perhaps the most unusual incident of the kind that ever came under my notice was in connection with a brand-new nest built by a pair of Magpies (*Pica rustica*), and on which, just when it was ready for eggs, a pair of Kestrels (*Falco tinnunculus*) set envious eyes. By sheer good fortune I chanced to arrive on the scene one morning just as it was light, and was an eye-witness of a regular pitched battle between the opposing species. The Magpies were eventually worsted, and some ten days later I scaled the tree, a tall larch in a secluded spinney near to Skeffington, and possessed myself of a truly lovely clutch of eggs belonging to the victors. The incident is chiefly interesting from the fact that Kestrels are popularly supposed to appropriate—when they have need so to do—old nests only.

May I be allowed to take this opportunity—of pen in hand—of informing many bird-loving correspondents who have written to me privately, as well as others who may be interested, that circumstances have necessitated my abandoning—at any rate for the present—all hope of publishing my 'Original Sketches of British Birds'? The work, dealing with the experiences of half a life-time spent, I may say, uninterruptedly amidst birds in their native and varying haunts, and completed so long ago as 1895, has been found altogether too costly to produce at the author's private expense. I am emboldened to seek the privilege of giving the foregoing statement publicity through the medium of 'The Zoologist' in the hope that any possible misunderstanding in the future will thereby be averted, seeing that extracts from the manuscript have already appeared, to wit, in the late Mr. F. Poynting's beautiful work entitled 'Eggs of British Birds'; while the author, in publicly acknowledging his indebtedness, alluded to the 'Sketches' as on the eve of publication—a statement which I had reason at the time to believe was eminently justifiable.—H. S. DAVENPORT (Melton Mowbray).

**The So-called St. Kilda Wren.**—After reading Mr. H. S. Davenport's note (*ante*, p. 413), I turned to Mr. C. Dixon's book, 'Lost and Vanishing Birds,' where I find the following statement:—"Perhaps we [*i. e.* Mr. C. Dixon] may be forgiven for taking exceptional interest in the fate of this bird; for we had the pleasure of ascertaining that it differed in certain respects from the Wren found in other parts of the British Islands. In 1884, when we brought the first known specimen from St. Kilda, the bird was common enough on all the islands of the group, and its cheery song could be heard everywhere." In the face of this distinct assertion the writer in the 'Spectator' may be excused for speaking of Mr. C. Dixon as the discoverer of the St. Kilda Wren. I will not enter upon the question whether *Troglodytes hirtensis* is entitled to specific or subspecific rank, though nearly all the authorities, I think, incline to the latter opinion. Mr. Davenport is doubtless right in saying that in 1698 Martin and many other writers since have recorded the existence of a Wren on St. Kilda. But the question is whether Seebohm (Zool. 1884, p. 333) and Mr. Dixon ('Ibis,' 1885, p. 80) were the first to point out that the Wren obtained by Mr. C. Dixon on St. Kilda differed from the Common Wren of the United Kingdom (*Troglodytes parvulus*). If Mr. C. Dixon was the first to discover this fact, would he not deserve the title of "the discoverer of the St. Kilda Wren," to which Mr. Davenport appears to take exception?—H. RUSSELL (Shere, Guildford).

**Varieties of Green Plover, &c.**—We have about here a white-green Plover, a cream Starling, and a grey Sparrow (House). Varieties are much scarcer, at any rate in Notts, than they used to be, and I only hear and see one now and again.—J. WHITAKER (Rainworth Lodge, Mansfield, Notts).

**Scoters in Notts.**—Five Scoters (Common) were seen on Lamb Close on Aug. 22nd last. There was one on one of the ponds here about same date.—J. WHITAKER (Rainworth Lodge, Mansfield, Notts).

**Crossbills in South-western Hampshire in 1898.**—Last year I recorded (Zool. 1897, p. 428) the occurrence of this peculiar species in July in the neighbourhood of Bournemouth. During August last I again visited the same locality, and, strange to say, I saw several of the birds not a hundred yards from the trees where I had detected them the previous season. Amongst the ornamental shrubs and trees planted in the grounds of many of the recently erected "villa" residences, the mountain ash was rather conspicuous from its pretty foliage and the fast ripening bunches of scarlet berries. One morning soon after daybreak I heard quite a "chattering" and apparent commotion with some birds not far from my bedroom, and, having got to the window, I saw that a number of Missel Thrushes, taking advantage of the quiet time and absence of man, were disputing in a

most vigorous manner the possession of the ripest berries with some smaller species of bird, which latter seemed quite capable and willing to offer battle to its more bulky antagonist. At first it was scarcely light enough to see what the smaller birds were, and the object of the Thrushes seemed to be to drive them from the neighbourhood, as they chased them from one tree to another, and by so doing they flew almost close to the window, when I saw they were Crossbills. I sat and watched them for some time, and eventually both Thrushes and Crossbills got their breakfast. This continued for several mornings, until the trees were stripped of their berries, and as long as the feast lasted both Thrushes and Crossbills were in evidence during the early hours of the day; but a curious fact connected with it is that, although a few Thrushes occasionally made a stealthy visit to the trees during the bright sunshine, I did not see a Crossbill anywhere in the neighbourhood at noontide, except one day when the cat belonging to the house brought in one, an immature bird in the yellow and red plumage; but it had been dead for some time. An elder tree, the fruit of which was also ripening, was a great attraction to a number of Starlings, but the right of appropriation of the berries was often a disputed point between them and the Thrushes. I did not see the Crossbills attempt to touch the berries, but I suppose it was only a natural sequence, as they prefer the seed-like kernels to the pulp, and is said sometimes to be destructive in orchards by splitting open the apples for the sake of the kernels. This, however, I have never been able to verify from personal observation. Referring to the occurrence of Crossbills in the neighbourhood of Ringwood, I may say that I am not prepared to establish the fact of the species nesting, but I can positively assert that the species put in an appearance from various places, and all points of the compass, from January to the present time (Nov. 8th); and now I understand there are numbers of them in the locality; but it must be borne in mind that their much-loved coniferous trees are comparatively common both east and west of the Avon valley. In the early part of the year I saw several, and heard of many others in and about the neighbourhood of the New Forest; I think they often frequent that locality in the winter, but in April they were still to be found there. During March numbers of them were observed at Parley, near Christchurch, and other places at no great distance, and in June one was sent me from Fordingbridge: it was in a pntid condition, having been picked up; at the same time I heard of others in East Dorset. In connection with the occurrence of the species, I may relate an incident that occurred, I believe, in May or beginning of June, but I foolishly did not note the date. A labouring man asked me if the cock Greenfinch ever had any red about it, as he had seen a hen feeding two or three young ones on the branch of a fir tree not far from his house, and sometimes they were

accompanied by another bird which he was sure had red about its plumage. This occurred within two miles of Ringwood, on the west side of the Avon, and near some young fir woods. I paid very little attention to the man's story at the time, as I often have some extraordinary tales brought about birds; but, as the Crossbills have put in an appearance both before and since, there is a possibility it was that species the man had observed. I give the story for what it is worth; and I may further mention that, especially in September, the birds were comparatively common in the same locality, and the man brought me a very brightly coloured male, and said he believed it was the same sort of bird he had seen in the summer. As the female Crossbill is of a greenish yellow colour, there is a possibility—perhaps very vague, some would say—of the man being correct about the species nesting in the trees near his house. I regret I did not investigate the matter at the time. Several of the birds I have seen were very brightly plumaged—one in particular was almost uniformly of a very handsome orange-red from head to tail; others were in various stages of dull greenish yellow and pink, and a few were darkly streaked upon the breast. Many people who saw the birds noted the well-known characteristic of the species, in that they were so “tame” and comparatively unsuspicious of danger; in some instances they were caught and caged, and amused their captors by the odd antics and dexterous manner in which they secured the seeds of the fir-cones; within a very short time of their capture fearlessly feeding in sight of any person, and curiously twisting their incurved beaks in and out the wires of their prison. Some specimens fell to the catapults of the roving schoolboys, who took advantage of the docility of the species and their Tit-like habits as they hung and swayed upon the branches where food was to be obtained. With regard to the curvature of the beak, in the largest half of the birds I saw the upper mandible was curved to the right; but this only proves how indiscriminately this “crossing” occurs, for on a former occasion, on examination of a number of specimens, I observed just the reverse; but any person examining the head and neck cannot fail to note the apparent bulk of these parts, and on dissection of same must be struck with the strength of muscles which enables the mandibles to be worked with such extraordinary lateral power. The fleshy protuberances on the sides of the skull remind one of the head of the Hawfinch.—G. C. CORBIN (Ringwood, Hants).

**Heron Nest of Wire.**—Sir Harry Bromley has given me that wonderful Heron nest made the greater part of wire. There must be yards and yards of it. How the bird got it and where I do not know, and how it ever got it through the trees and twisted it into shape. Many naturalists have seen it, and all think it the most wonderful nest they ever saw.—J. WHITAKER (Rainworth Lodge, Mansfield, Notts).



**Great Skua in Notts.**—A Great Skua was flying over lake at Lamb Close for some time on Aug. 22nd. It made several dashes at Green Plovers, and also at a Heron. After a time it flew away north.—J. WHITAKER (Rainworth Lodge, Mansfield, Notts).

**Late Nesting of the Corn Bunting.**—This bird is notably a late breeder. Personally I never found eggs till the middle of June; but this year, when shooting down in Holderness, I was shown two nests that had been mown over in the corn-fields—one on Sept. 2nd, containing eggs which were slightly incubated, and the other on Sept. 5th, containing perfectly fresh eggs.—OXLEY GRAHAM.

**Late Stay of Swift.**—A Swift (*Cypselus apus*) was observed by me this afternoon (Oct. 12th) flying round this house for some time. I see by the 'Field' that Swifts are staying late this season, but perhaps you may consider my observation of sufficient interest to chronicle.—H. MARMADUKE LANGDALE (Royal Cliff, Sandown, Isle of Wight).

#### REPTILIA.

**Adder Swallowing its Young.**—I have had the pleasure of meeting here to-day (Aug. 15th, 1898) Mr. J. W. Kimber, of Tracey, Torquay, and formerly of Tracey Farm, Great Tew, Oxfordshire. He tells me that just about the date of the Crimean War, he, with his woodman, Richard Eccles, were walking down a woodland path in Minotens Woods, near Witney, on a warm morning about the end of May, when an Adder struck at the woodman's gaiter. The woodman called out to stop Mr. Kimber, saying, "She would not have done that unless she had got young ones." After waiting a short time, he called out again, "Now, sir, come on, and you will see something worth your notice." Mr. Kimber and the woodman then watched, and saw the young ones (four in number) crawl into the old Adder's mouth, she lying at full length with her mouth open to receive them. The woodman then struck the Adder with his stick, and killed her. In a few minutes the young ones crawled out through the wounded mouth of the mother, and of course met the same fate. At the time Mr. Kimber was not aware that the fact he and the woodman had together witnessed was a disputed one, or steps would at the time have been taken to inform naturalists of so well-authenticated an instance. Mrs. Kimber, who is here also with her husband, well remembers his relating the fact to her on his return home on the day on which it occurred. Mr. Kimber, being seventy-five years of age, is desirous that the above statement should be recorded, in the interests of natural history, while opportunity remains. The writer and Mr. and Mrs. Kimber append below their signatures to this

statement.— ADAM J. CORRIE, J. W. KIMBER, M. A. KIMBER (Lansdown Grove Hotel, Bath).

[We publish the foregoing as received. We are informed by Mr. Tegetmeier that the proprietors of the 'Field' have for very many years offered a reward of £1, and for the last three years of £5, for a Viper seen to swallow its young and received dead with the young inside; but the reward has not yet been claimed. The young Vipers burst from the egg with all their powers perfect, and escape rapidly into the grass directly they are disturbed, so rapidly that the bystander concludes they must have disappeared down the mother's throat. No case of Vipers swallowing young has ever been observed at the Zoological Gardens at Regent's Park.—ED.]

#### AMPHIBIA.

**Abnormal Eyes of *Hyla arborea* and *Bombinator igneus*.**—I recently purchased a small Tree Frog (*Hyla arborea*), and sent it to a friend who was interested in batrachians. A few days later he informed me that the Frog was blind in one eye. A strong light having been thrown into the eye, I carefully examined the interior of the diseased organ with a powerful lens. The iris was widely dilated, normal in colour. The whole of the interior of the eye was transparent like glass, and behind this was a greyish surface, showing no trace of blood-vessels. The affected eye was twice the size of the normal one, and the animal was continually closing the eyelid over it. The increase in size of the eye was most marked in the portion nearer the ear. I have similarly examined a normal Tree Frog, but merely obtained an image of the light reflected from the anterior surface of the cornea, the interior of the eye appearing black with no transparency. The nature of the disease in the Frog's eye is a puzzle to me. From a careful dissection of a Toad's eye it would seem that the greyish appearance seen in the diseased eye was the normal retina, so that the anterior portion of the eye seems to be at fault. The Frog is lively, and takes flies readily. As a contrast to the above, I may mention a specimen of *Bombinator igneus* which I kept for some time, in which one eye was curiously small, much smaller than the other. I attributed this to arrest in the normal development of the eye.—GRAHAM RENSCHAW (Sale Bridge House, Sale, Manchester).

## EDITORIAL GLEANINGS.

AMONG the more important acquisitions to the British Museum by purchase during the year special mention may be made of the Whitehead Collection of Birds and Mammals from the Philippines ; the second instalment of the Bates Collection of Heteromorous Coleoptera (13,798 specimens); a fine stuffed Lion from Machako's, British East Africa, shot by Mr. S. L. Hinde; the Savin collection of fossil vertebrate remains from the Norfolk Forest-bed series of deposits; a series of fossil remains from the Oxford Clay of Fletton, selected from the collection of Mr. A. N. Leeds; and a fine set of specimens of American Palæozoic Bryozoa.

The number of separate presents reported as having been received during the year by the several Departments of the Museum amounted to 1622, as against 1518 in the preceding year. The following are of special interest:—From Messrs. F. Du Cane Godman and Osbert Salvin: Further portions of their collection of the Coleoptera of Central America, comprising 5468 specimens; the first instalment of their collection of New World Lepidoptera of the family *Danainæ*, comprising 486 specimens; and 2586 specimens of Heterocerous Lepidoptera of various orders from Central America. From Colonel John Biddulph: A fine collection of birds from Gilgit, consisting of 3386 skins of nearly 250 species. From Dr. John Anderson, F.R.S.: A large and valuable collection of Reptiles and Batrachians made by him in Egypt and Nubia between the years 1891 and 1895, and forming the basis of a large work, which he has now published. From Mr. F. C. Selous: An interesting series of South African Mammals, including a Springbok, and pairs each of Bontebok, Blesbok, Gnu, and Inyala Antelopes. From Mr. S. L. Hinde, Resident Medical Officer at Machako's, British East Africa: An interesting and valuable series of Natural History specimens (chiefly Mammals, Birds, and Insects) collected by him in British East Africa, and including specimens of species hitherto unrepresented in the Museum Collection. From Capt. F. O. Wathem: The skeleton and skin of a Gavial (*Gavialis gangeticus*) from near Muttra, in the North-west Provinces of India. From Miss A. M. R. Stevens: A very fine specimen of the same reptile from Behar. From the Canadian Department of Marine and Fisheries: A stuffed Seal (*Phoca grænländica*) from the Gulf of St. Lawrence. From Mr. Thorpe, of St. Helena (through the Colonial Office): The shell of a large Land Tortoise (*Testudo elephantina*), which died at St. Helena about twenty years ago. From the Hon.

Walter Rothschild: A life-size photograph of a very large Tortoise (*Testudo daudinii*). From the President of the American Museum of Natural History, New York: A series of thirteen large photographs of skeletons and restorations of extinct Tertiary Mammalia.

---

FOR the past two years Prof. Dendy, of Canterbury College, New Zealand, has been minutely investigating the development of the Tuatara Lizard (*Sphenodon punctatus*), declared to be the most remarkable reptile now living in New Zealand; and a detailed account of the results of his researches has just arrived in England, and will shortly be published. Although the Lizard in question is said to be the oldest existing type of reptile up to the present, little has been known of its life-history, as it is very rare, and shy and retiring in its habits. The Tuatara Lizard was first mentioned in a diary kept by Mr. Anderson, the companion of Captain Cook; but the first really detailed account of the reptile was given by Dieffenbach in 1843,\* when he said:—"I had been apprised of the existence of a large Lizard which the natives call Tuatéra, or Narara, and of which they are much afraid." Owing to the rarity of the Tuatara Lizard, the New Zealand Government passed an Act to prohibit the taking or slaying of the reptile, but, as usual, forgot one of the most important points, namely, the insertion of a clause forbidding the collecting of the eggs. Fortunately for the Tuatara, however, Mr. P. Henaghan, the principal keeper on Stephen's Island, appears at present to be the only man who knows where to look for them, although it is stated that two German collectors have been lately making vigorous but vain efforts to obtain specimens of the eggs. Prof. Dendy had permission granted him by the Government to collect both eggs and adults, and with the help of Mr. Henaghan has been so successful in his investigations of the life-history of the interesting reptile, that many new and important facts will now be made known to the scientific world. The adult animal has a spotted skin, and a crest of separate white flat sharp spines, and is possessed of three sets of teeth. On Stephen's Island the eggs of the Lizard are found to be laid in November, and the embryo pass the winter in a state of hybernation unknown to any other vertebrate embryo, and do not emerge from the egg until nearly thirteen months have elapsed. One curious fact that has come to light is that in the latter stages of its development the skin of the young animal has a strongly marked pattern of longitudinal and transverse stripes, which disappear before hatching, giving place to the spotted skin of the adult animal. This Lizard is particularly interesting, owing to the fact of its being allied to the extinct reptiles of the Triassic age.—*Daily Mail*.

\* Dieffenbach, 'Travels in New Zealand,' ii. p. 204.



It is interesting to hear that a specimen of *Scutigera coleoptrata*, a South European centipede, was recently captured at Colchester. This is the second time that its occurrence in Great Britain has been recorded. The first time it was introduced among a quantity of old rags into a paper-mill near Aberdeen, where, being protected by heat, it bred and has become established.

---

A FISH discovered in the stomach of a Cachalot by the Prince of Monaco during one of his expeditions has been determined as indistinguishable from the common Eel, and this points with great emphasis to the fact that this form, whose habits are so obscure, must at times take to the open sea.

---

THE nature of the water supply being of immense importance to the welfare of humanity, especially of that portion living in communities, it may be well to refer to a paper written by Mr. Geo. W. Rafter, "On Some Recent Advances in Water Analysis and the Use of the Microscope for the Detection of Sewage," though published as long ago as 1893 in the 'American Monthly Microscopical Journal,' and which was read before the Buffalo, N. Y., Microscopical Club:—

The complete details of these various studies are too extensive to be given at length, and we may merely refer to some of the results at Hemlock Lake, where plant forms have been identified as follows:—Chlorophyceæ, 20; Cyanophyceæ, 15; Desmidiæ, 14; and Diatomaceæ, 41—making a total of plant forms of 90. The maximum quantities of some of these minute plants per 100 cubic centimetres are—Protococcus, 2000; Anabæna, 20,000; Cœlosphærium, 34,000; Asterionella, 40,000; Cyclotella, 60,000; Fragillaria, 25,000; Stephanodiscus, 60,000. The total number of animal forms is 92, of which 3 are classed as Spongidæ, 10 as Rhizopoda, 29 as Infusoria, 2 as Hydroida, 14 as Rotifera, 3 as Polyzoa, 21 as Entomostraca, 1 as Malacostraca, and 10 as insect larvæ. As to maximum quantities of animal forms observed, we find among Infusoria—Dinobryon, 12,000; Glenodinium, 25,000; and Vorticella, 9600.

The quantities of minute life present in Hemlock Lake, while apparently large, are in reality quite small, as will be readily appreciated by reference to a statement of the number present in Ludlow reservoir, Springfield, Massachusetts, where the following maximum quantities per 100 cubic centimetres have been observed:—of the Diatoms, Asterionella and Melosira, 405,600 in April, 1890; Cœlosphærium, 157,600 in August, 1889; Chlorococcus, 322,400 in October, 1889: of animal forms the infusorian Dinobryon showed 364,400 per 100 cubic centimetres in February, 1890. But even the large quantities of minute life found at

Springfield are dwarfed into comparative insignificance by the results of a series of examinations of the water supply of Newport, R. I., as given by Dr. Drown in a recent report, from which it appears that on August 31st, 1891, there were present in Easton's Pond, one of the sources of supply for Newport, the large number of grass-green Algæ (*Chlorophyceæ*) of 677,750 per 100 cubic centimetres; on September 11th, 1891, there were found 927,400; on October 8th the number had fallen to 675,700, but subsequently again rose until the enormous maximum was attained on January 18th, 1892, of 1,428,600 per 100 cubic centimetres. Diatoms were present on the same date to the amount of 200,700 per 100 cubic centimetres, giving a total of Diatoms and grass-green Algæ of 1,629,300.

---

In the July number of the 'Home University' is an interesting note "On Temporary Museums," which we here reproduce:—

We desire strongly to recommend as a very efficient aid to education the formation of Temporary Museums. These are especially suitable for places of summer resort at the seaside, or elsewhere, but they might also be attempted with success in almost any town. A museum of this kind was organised last summer at the pleasant little town of Hunstanton on the Norfolk coast, and it is upon the experience there obtained that our suggestions and advice to others who may be encouraged to attempt the like will be based. At Hunstanton the Museum was open five weeks, that is, during almost the whole time that the Board-School-rooms were at liberty. The school-rooms were rented for a nominal sum, and were fitted up with boards laid across the desks, upon which objects were displayed. A Committee of Organisation and Management, composed partly of residents and partly of visitors, was, of course, extemporised, and appeals were made for the loan of objects of interest. It is scarcely to be doubted that in almost any town there would be found those who for such a purpose would be willing to lend pictures, cases of stuffed birds, insects, fossils, and miscellaneous curios. With objects of this kind to make the chief display, the members of Committee would easily supply the rest. A few books of reference should be borrowed—if possible a copy of the 'Encyclopædia Britannica'—and an energetic Sub-Committee to name and label the objects should commence its labours a week or two before the opening, and continue them throughout. Those thus engaged would find their reward in the acquisition of much knowledge, for more is to be learned in the act of making and arranging museums than can be got by visiting those already in good order.

---

At a recent meeting of the Linnean Society at Burlington House, a series of interesting photographs of a fine hen Buzzard, of the common

species, amicably, not to say affectionately, living with a largish chicken in Mr. Alan Crossman's aviary. The story of this strange companionship is not a long one. The Buzzard desired to sit, and hen's eggs were given it to brood over. On the first occasion a chicken was hatched and disappeared—ask not where; on the second, two left the eggs, but only one lived, and became the foster-child of the Buzzard, which brought it up, and still continues to treat it in the light of a relation, though now nearly full grown. In this case two instincts of the Buzzard came into collision—that of killing weaker birds to live upon, and a natural desire to bring up young. Taking into consideration that instincts do not always give rise to stereotyped actions, but are to a certain extent modified by circumstances, and again, that the raptorial bird had had no necessity for some time to seek its prey, it is not so surprising perhaps that the maternal instinct proved itself the stronger.—*Daily Mail*.

The above is by no means the first occasion that a Buzzard has been known to bring up chickens. Yarrell, in his first edition of his 'British Birds,' vol. i. p. 78 (1843), says:—"The extreme partiality of the Common Buzzard to the seasonal task of incubation and rearing young birds has been exemplified in various instances. A few years back a female Buzzard, kept in the garden of the 'Chequers Inn' at Uxbridge, showed an inclination to sit by collecting and bending all the loose sticks she could obtain possession of. Her owner, noticing her actions, supplied her with materials; she completed her nest, and sat on two hen's eggs, which she hatched, and afterwards reared the young. Since then she has hatched and brought up a brood of chickens every year."

---

THE following particulars concerning the expedition which has left England for the purpose of visiting the almost unexplored island of Socotra, situated about one hundred and fifty miles east-north-east of Cape Guardafui, have been given in the 'Times.' The staff consists of Mr. W. R. Ogilvie Grant, of the department of Zoology in the British Museum; Dr. H. O. Forbes, the director of the Liverpool Museums; and Mr. Cutmore, taxidermist attached to the latter institutions. The Royal Society, the Royal Geographical Society, and the British Association have provided part of the funds for the undertaking. The expedition has sailed for Aden, proceeding thence to Socotra by the Indian Marine guardship 'Elphinstone,' which, in compliance with a request made by the authorities of the British Museum, has been placed at the disposal of Mr. Grant and Dr. Forbes for the purpose of conveying them to the island and back to Aden on the termination of their stay. The main object of the expedition is to investigate thoroughly the fauna of the island, and make large and complete collections in every branch of Zoology.

IN a special Antarctic number of the 'Scottish Geographical Magazine,' Sir John Murray urges the need of a British Antarctic Expedition. The importance of such an expedition has been insisted upon more than once, and we hope that Sir John Murray's efforts will assist in impressing the mind of the Government. Our maps are a feeble blank concerning Antarctica, and the information we possess as to its fauna and flora is inconspicuous. A few Cetacea, a few Seals, and a handful of birds are all that Mr. Chumley can record; while as to the Invertebrata, practically all we know was gained in a few dredgings by the 'Challenger' during the cruise from the Cape of Good Hope to Australia. Dr. Murray's plea is not for a dash to the South Pole, but for a "steady, continuous, laborious, hydrographical, and topographical examination of the whole South Polar Area during several successive years," . . . which "would enrich almost every branch of science, and would undoubtedly mark a great advance in the philosophy of terrestrial physics." He asks some of our wealthy citizens to come forward with £100,000, which might be placed in the hands of the President of the Royal Society.—*Natural Science*.

---

SOME very interesting ornithological news has lately been received from New Zealand. A fourth specimen of *Notornis mantelli*, a large flightless Rail, has been captured. The last specimen of *Notornis* was captured some twenty years ago, and it has long been considered extinct by most people, although a few have clung to the idea that the species yet lived hidden in some of the great marshes of New Zealand. The name *Notornis* was originally given by Owen to some fossil bones discovered in the North Island, New Zealand. In 1849, a few years later, Mr. W. Mantell obtained, in the Middle Island, a freshly-killed specimen of a flightless Rail, which was declared to be of the same species as Owen's *Notornis*. A second specimen was obtained in 1851, and a third in 1879. The present specimen was killed by a dog in the bush adjoining Lake Te Anau. The skin and all parts of the bird have been carefully preserved, so that we may look forward to having some exceedingly valuable details concerning this interesting bird. The fact that this fourth specimen was a young female proves that the bird is by no means extinct, and also that it is not easy to find.—*Knowledge*.

---

"BRUSHER MILLS," the well-known New Forest snake-charmer, has so far this year killed sixty Snakes and ninety Adders, and destroyed between eighty and ninety Wasps' nests.







Zoologist, 1898.

Plate IV.



*Vespertilio nattereri*, Desm.